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Location of injury site in chronic low back pain patients: an electromyographic and mechanomyographic analysis

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Location of Injury Site in Chronic Low Back Pain Patients: An Electromyographic and Mechanomyographic Analysis

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By

Mark Gorelick, MSc

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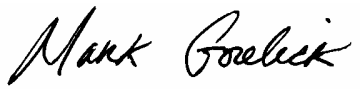
Declaration

CERTIFICATION

I, Mark Gorelick, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Department of Biomedical Sciences, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.



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Abstract

The primary aim of this thesis was to determine if anatomical injury site in chronic low back (CLBP) patients can be identified by two complementary non-invasive diagnostic techniques, surface electromyography (sEMG) and mechanomyography (MMG). The application of these techniques to injury site identification is based upon the hypothesis that muscle tissues surrounding an injured joint are physiologically distinct from those surrounding "healthy" joints. Such changes in muscle physiology, associated with underlying joint pathology, may include alterations in muscle fibre type composition and number with a corresponding change in the muscle's speed of contraction and its pattern of neuromotor control. These injury-induced changes in muscle function should be readily detected, at least in superficial muscles, by simple kinesiological techniques such as sEMG and/or MMG. Six experimental studies were conducted to validate the diagnostic tools (sEMG and MMG) and to locate injury site in a total of 73 normal and CLBP subjects and a group of 12 Wistar rats. The results of these studies validated the combined sEMG and MMG techniques and concluded that injury site in diagnosed CLBP patients could be accurately identified to within one vertebral segment of the injured zygapophyseal joint through application of the MMG technique. Importantly, the MMG technique appeared to be more sensitive than the sEMG technique to identify the injury site in CLBP patients. Although the sEMG technique could significantly ($p<0.05$) differentiate between the CLBP and healthy control groups, it was unable detect specific changes in muscle contractile properties associated with underlying joint pathology.

List of Publications

Peer Reviewed Publications

Gorelick M, Brown JM, Groeller H. (2003). Short-duration fatigue alters neuromuscular coordination of trunk musculature: implications for injury. *Applied Ergonomics.* 34 (4): 317-325.

Conference Presentations

Gorelick M, Brown JM, Groeller. (2005). *Whole muscle activation indicates eccentric muscle fatigue and damage.* The 2nd International Conference on Movement Dysfunction, Endinburgh.

Brown JM & Gorelick M, (2003). *Muscles within Muscles,* NSW Conference of Science and Medicine in Sport, Sydney, Australia.

Gorelick M, Brown JM, Groeller H et al. (2002). *Musculoskeletal indictors of injury site in chronic low back pain: control data.* Australia Conference of Science and Medicine in Sport: Sports and Medicine at the Extremes, Melbourne, Australia.

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